FEB 11 1985

965372

3

DRAFT TECHNICAL REPORT NO. 3

PHASE 2 STAGE 2C
SELECTION OF PREFERRED SITE

ECONOMIC ASSESSMENT

C. E. WATSON AND ASSOCIATES LTD.

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT OF
SOLID WASTE MANAGEMENT

JANUARY 1985

TABLE OF CONTENTS

Section		Page
	SUMMARY	i
1.0	INTRODUCTION	1-1
2.0	ECONOMIC EVALUATION FACTORS	2-1
3.0	APPROACH TO COST ANALYSIS	3-1
4.0	LANDFILL REQUIREMENT	4-1
5.0	ECONOMIC RATE ASSUMPTIONS	5-1
6.0	REVIEW OF ECONOMIC SUB-FACTORS	6-1
7.0	COST FACTORS	7-1
	7.1 Site Capital Costs	7-1
	7.2 Road Reconstruction Costs	7-2
	7.3 Site Operating Costs	7-2
	7.4 Haul Costs and Transfer Stations	7-4
	7.5 Property Value Impacts	7-9
	7.6 Mitigation Measures	7-10
8.0	TOTAL SITE PLAN AREA COSTS	8-1
9.0	PUBLIC VS. PRIVATE OPERATION	9-1
10.0	DISTRIBUTION OF COST BURDEN	10-1
11.0	CONCLUSION	11-1

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

LIST OF TABLES

Table		Following Page
1.	Cash Flow Analysis for Site Plan Area A	8-3
2.	Cash Flow Analysis for Site Plan Area B	8-3
3.	Cash Flow Analysis for Site Plan Area C	8-3
4.	Cash Flow Analysis for Site Plan Area D	8-3
5.	Cash Flow Analysis for Site Plan Area E	8-3
6.	Cash Flow Analysis for Site Plan Area F	8-3
7.	Distribution of Cost Burden for Alternative Site Plan Areas in Halton	10-1
8.	Summary of Cost Analysis for Halton Environmental Assessment - Stage 2C	11-1

006372

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

Appendix

A. Annual Landfill Waste Tonnage
B. Site Plan Area Development Costs
C. Site Operating Cost Assumptions
D. Assumptions for Haul Cost Analysis and Transfer Stations
E. Summary of Transfer Station Research
F. Region of Halton Compensation Policy

SUMMARY

The Stage 2C economic analysis evaluates the six Site Plan Areas based on the following cost criteria: site capital costs; site operating costs; haul costs; property value impact; indirect economic impacts; and mitigating measures. The cost analysis employs a total annual cash flow approach for each of the components, culminating in a present value (PV) for each of the Site Plan Areas as of January 1, 1985. The annual rates assumed in the Stage 2C analysis were 7 percent inflation and a 12 percent discount rate over the long term (24 year period).

The application by Site F's owners to operate privately a landfill site does not affect its suitability, and it is assumed at this stage that the Region will own any landfill facility on any of the Sites.

The Region of Halton, the area municipalities and the private sector will each bear part of the total landfill cost. From the Regional perspective, Sites A, D and E would be the lowest cost alternatives, Site F's costs 30% higher, and Sites B and C's costs twice as high (see Table 7). The cost differential between the highest and lowest cost site is considerably greater for the Region than for the area municipalities or the private sector. For the area municipalities, Sites A, B, and C would be the least expensive, Site D's costs 9% higher, and Sites E and F, the most expensive (27% higher). The situation for the private sector is similar to that for the area municipalities with Sites A, B, and C having the lowest costs, Site D as much as 9% higher, and Sites E and F, the highest costs (as much as 28% higher).

On an overall basis, the ranking of the six Site Plan Areas from lowest to highest total cost (using the mid-point of the cost range) is as follows:

Site Plan Area	(PV ($000,000)	Index
A	51.3	100
D	53.6	104
E	55.3	108
F	63.9	125
B	78.9	154
C	80.3	157

1.0 INTRODUCTION

The economic analysis in Stage 2C: Selection of the Preferred Site, evaluates a full range of economic factors in determining the most preferred Site for landfill in Halton Region from a cost perspective. The emphasis in the analysis is on components which will serve to differentiate among the Sites. Comprehensive costing for the preferred Site will be completed in a subsequent phase. The economic assessment is one element of an extensive process to select the preferred site. Costs rank as a sixth order of priority, the lowest of all the evaluation factors.

2.0 ECONOMIC EVALUATION FACTORS

The Stage 2C Work Program stated that the same cost components used in the previous, Stage 2B, analysis would be employed in Stage 2C, as follows:

- Site capital costs.
- Site operating costs.
- Haul costs.
- Property value impact.
- Indirect economic impacts.
- Costs for mitigating measures.

3.0 APPROACH TO COST ANALYSIS

The cost analysis in Stage 2C employs a total annual cash flow approach for each of the components, culminating in a present value (PV) for each of the Site Plan Areas as of January 1, 1985. The Sites were then arranged in ascending order of present value (PV). No additional weighting was attached to any of the six cost factors.

4.0 LANDFILL REQUIREMENT

The Stage 2A and 2B analyses were based on a long term (20 year) landfill requirement in Halton of 8.7 million cubic yards. This waste forecast was determined in the Stage 1 "Waste Needs and Systems Analysis" Report as well as a number of other assumptions concerning the amount of waste the Energy from Waste (EFW) plant(s) would handle plus contingencies. Since that time, there have been a number of important events which necessitated reviewing and revising the waste forecast and the landfill volume requirement. A review of Stage 2B was completed in November, 1984, and approved by Regional Council on December 5, 1984. As part of the report "Review and Supplement to Stage 2B", several significant changes were adopted, as follows:

- Revised waste forecast period.
- Consolidation of the interim and long term forecast periods requiring the site to handle Regional waste from January 1987 to June 2008.
- Revised solid waste management system in which Regional Council directed that the Environmental Assessment study team seek a site which will accommodate 100% of the waste for eight years (June, 1988-1996) and 50% of the waste for a 12 year period (June, 1996-2008) during which the EFW facility(ies) is assumed to handle the remainder of the waste.
- Major reduction in waste at the Halton landfill site in 1983 resulting in a proportionate change in the waste per capita figure which played an important role in the forecast.

In addition, the single-site approach to landfilling was confirmed in the review of Stage 2B.

The revised landfill requirement determined in the "Stage 2B Review and Supplement Report", November 1984, was as follows:

Region's Most Probable Landfill Requirement	-	8.22 m.cu.yd.
Contingencies relating to population, waste per capita, landfill density, EFW downtime, and the possibility of new wastes	-	3.10 m.cu.yd.
		11.32 m.cu.yd.

The Stage 2B Review and Supplement Report recommended that six Candidate Sites identified in the original Stage 2B Report should be subject to further on-site investigations in the final site selection stage. In the previous stages, the Candidate Sites were of varying sizes and capacities. Consequently, it was not appropriate to compare them on a total cost basis and a cost per ton of waste capacity was used. In Stage 2C, Site Plan Areas have been defined so that the sites accommodate the full landfill requirement. As a result, a total cost for each Site Plan Area can be calculated and the cost figures for the sites may be compared directly.

As specified in the Stage 2C Work Program, a total annual cash flow approach was used in this Stage[1] with the comparison based on present value. A present value (PV) analysis (discounted cash flow analysis) incorporates adjustments to expenditures to account for the fact that they are made at different points in time and are not of equal value as a result of inflation and the cost of capital. As such, it puts cost (and revenue) entries on a comparable basis.

---

1 The Stage 2C Economic Analysis Work Program included a component concerning co-ordination between the EFW and Landfill Teams to develop a total system costing. Since the EFW Task Force is, at this point, not proceeding with a specific size of plant in a specific location, a total system costing is not possible.

5.0 ECONOMIC RATE ASSUMPTIONS

The annual rates assumed in this Stage 2C analysis were 7 percent inflation and a 12 percent discount rate over the long term (24 year period). These assumptions were developed on the basis of past trends in the Consumer Price Index and interest rates, as well as published economic forecasts. They differ somewhat from the figures used in the Stage 1 Waste Needs and Systems Analysis Report (9 percent inflation, 12 percent discount rate) and the Stage 2B Selection of Candidate Sites Report (6 percent inflation, 11 percent discount rate) due to changes in forecasted economic conditions.

The real rate of interest is the difference between the discount rate and the inflation rate (and in this case amounts to 5%). Thus, there is no change in the real interest rate assumption from the Stage 2B Report (11%-6%). As noted in the Stage 2B Report:

> If the 6% inflation rate and 11%[2] cost of capital (debenture rate) increase in lock-step at the same rate, there would be no impact since it is the real rate of interest (i.e., the difference between the two rates) which would affect the results. If the inflation rate increases more rapidly than the cost of capital, the real rate of interest declines and the present value of operating, haulage and other costs would increase in proportion to the decline in the real rate of interest. In the converse situation (the inflation rate increases more slowly than the cost of capital), the opposite would occur." (page 112 of Phase 2, Stage 2B, Selection of Candidate Sites)

---

2 Figure of 10% on page 112 in the Stage 2B Report is a typographical error. Note that 11% discount rate figure is indicated in the section "Rate Assumptions" on page 111.

6.0 REVIEW OF ECONOMIC SUB-FACTORS

In Stage 2B, Selection of Candidate Sites Report, seven economic sub-factors were identified that did not form part of the Stage 2B analysis due to their insignificant impacts or their inability to contribute to the process of differentiation among the Candidate Sites. Also, the large number of candidate sub-areas at the time dictated the level of detail to which these more minor factors could be investigated. These seven sub-factors have been reviewed to determine if they are more applicable at this stage of the analysis. Six were again rejected as having insignificant costs or no impact on site selection. These were: Provincial and Federal Governmental effect on taxes (two sub-factors); reduction in property taxes payable; net increase/decrease in government grants; private hauler operations; and effect on local businesses in site area. One sub-factor--impacts on land values bordering major haul routes--has been incorporated into the Stage 2C analysis.

7.0 COST FACTORS

The cost factors applied herein encompass all of the costs included in the original Stage 2B analysis, with the exception of the component "Tipping Fee Revenue Reduction Due to Site Location". This was excluded in Stage 2C on the basis that Halton's experience with increased refuse volumes at the existing Burlington landfill site in 1984 would indicate that this may have been a temporary factor and is not significant once the system has been operating for a period of time.

7.1 Site Capital Costs

Site capital costs include both property acquisition and site development costs. Conceptual designs for each of the six Site Plan Areas have been prepared by Hydrology Consultants and included in their Hydrogeologic-Hydrologic Assessment and Conceptual Design Technical Report. The Site Plan Areas will accommodate the full landfilled waste volume requirement (including contingency) of 11.32 million cubic yards.

The source for the property acquisition costs for the Site Plan Areas of A, B, C, D, and E was a report prepared by the Region of Halton's Property Management Division entitled "Cost Estimate of Candidate Sites A, B, C, D, and E, within the Regional Municipality of Halton" dated August 30, 1984, plus Addendum, November 1, 1984. Detailed site appraisals were not prepared for every property within each Site Plan Area, due to the magnitude of the task and problems of obtaining access to the properties. Properties were valued from the perspective of highest and best use based on an external viewing of each site and surroundings, a review of records including assessment, land use control documents and mapping, discussions with some owners, review of Registry Office information, and review of Regional files and other data. A 10% allowance for administrative costs such as legal, appraisal, and survey costs, was added to property valuations in each case.

For the Site Plan Area of F, Chambers and Company Ltd. was retained to appraise the site due to the greater complexity of valuing a quarry site.

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

Two valuations[3] were prepared for purposes of the Environmental--one considering the long-standing application for a private landfill operation on the site, and the other, excluding this consideration.

Site development costs were provided for each Site Plan Area by Hydrology Consultants with an estimate of approval costs supplied by Walker, Wright, Young Associates Limited. These costs are detailed in Appendix B.

The costing analysis for capital items assumes public ownership of the landfill site. The impact of a private operation is discussed in Sub-section 9.0.

7.2 Road Reconstruction Costs

The cost of reconstructing roads in the vicinity of the Site Plan Areas was provided by Giffels Associates Limited and described in the Transportation Assessment Technical Report. The capital cost figures, for reconstructing roads in 1984 dollars, are as follows:

Site A - $373,000
Site B - 60,000
Site C - 60,000
Site D - 75,000
Site E - 646,000
Site F - 60,000

7.3 Site Operating Costs

Site operating costs include a number of fixed and variable cost components developed from several sources including the Region of Halton Solid Waste Management Operating Budgets from 1982-1984, information from Hydrology

---

3 An additional valuation was prepared by Chambers and Associates, assuming Site F would handle only Burlington's waste. Since only a single site accommodating all of the Region's waste is being considered, this valuation did not form part of this analysis.

Consultants on extraordinary earthwork costs for Sites B, C and F (due to shale excavation) and leachate treatment costs. For Site A, information was provided by Giffels Associates Limited on additional access road operating costs.

The EFW facility(ies) is assumed to open in 1996 with capacity to handle 50% of the waste stream. Consequently, the waste volume to be landfilled reduces at that time, although, in practical terms, not to 50% of the total since the landfill must be sized to handle the plant(s) residues and contingency as well. However, operating costs will not reduce in proportion to the tonnage, as some costs are fixed. These fixed costs include the following:

- Regional administration.
- Environmental works (monitoring).
- Container station operation (on-site and three satellite stations).
- On-site maintenance and road construction by Regional staff.
- Contingency and emergency hours.
- Additional road operating costs (Site A only).
- Leachate pumping costs.

Landfill operating costs, treated as variable (on a per ton basis) include those covered by the Region's current contract with the Burlington landfill site operator and others as follows:

- Earthworks (including excavation and placement of daily and final cover).
- Placement and compaction of waste.
- Maintenance of on-site roads.
- Scale house operation.
- Litter and nuisance control.
- Leachate treatment costs.

Specific operating cost assumptions for each Site Plan Area are included in Appendix C. To calculate total annual operating costs for each Site, it was necessary to determine an annual landfill waste tonnage for use with the variable costs. These figures are shown in Appendix A. They represent a maximum tonnage combining the most probable waste forecast and the contingencies as well as allowance for EFW facility(ies) downtime and residue (after June 1996). The maximum forecast was used to be consistent with the

approach for capital costs. Selection of this approach has no direct impact on the final results of the site selection, as the same tonnages were used for each site.

Similar to the consideration of capital costs, the operating cost analysis assumes public ownership of the landfill site.

7.4 Haul Costs and Transfer Station(s)

The haul cost component for each of the Site Plan Areas was calculated based on information on haul distances and haul times from each of ten Regional zones to the Site Plan Areas.

These were prepared by the Regional Planning and Development Department and are included in the Transportation Assessment Technical Report prepared by Giffels Associates Limited. The years selected for analysis included 1988, representing the early period of the landfill operation, and 1996 and 2008, the period in which the EFW facility(ies) is projected to be in operation. The planned road network was assumed to be in place by 1996 with no changes occurring after that year. Due to their close proximity, Sites A, B and C were assigned identical haul distances and times in each period.

The annual landfilled waste tonnages used in calculating the haul cost analysis are listed in Appendix A. They are somewhat lower than the figures used for site operating costs after 1996 as they exclude the EFW facility(ies) residue; haul cost for this item would be applicable to the plant(s) rather than the landfill and the plant location(s) is unknown.

The cost assumptions were developed from information supplied by Halton Hills, Milton and Oakville and other municipalities in the Metro area concerning salaries of operators (including fringe benefits), gas and maintenance costs and capital costs of vehicles. The costs are in 1984 dollars and are outlined in Appendix D. Gas and maintenance cost calculations were based on two-way trip distances from each zone to the landfill site, while salaries and capital costs were related to two-way trip times (including 15

minutes drop-off time at the landfill site[4]). All costs were assumed to increase directly with inflation, except capital costs for trucks which were amortized over a seven-year period.

Municipal collection vehicles are, of course, only one component of a wide range of major hauler vehicles which enter the landfill site. Others include major private haulers, vans and pick-up trucks. (Cars are considered as minor haul vehicles and discussed subsequently.) The types of haulage vehicles are discussed in detail in the Transportation Assessment Technical Report prepared by Giffels Associates Limited. Costs for each type of major hauler will vary on a per ton minute and/or per ton kilometre basis. The analysis is based on typical municipal collection vehicle costs as an approximate representation of all types of major hauler vehicles. Since the same assumptions are used for each Site Plan Area, there is no effect on the selection process.

For each site in the two time periods analyzed, a weighted cost-per-ton figure was calculated using the combination of the salary, gas and maintenance costs for each zone, weighted by the percent of total waste coming from that zone. This was derived from Table 6 in the Technical Report prepared by Giffels Associates Limited. A sample calculation for one site is included in Appendix D. The weighted per ton figure was applied to the appropriate annual tonnages in Table 9. Capital costs were calculated on a per ton basis separately, since they did not inflate on an even annual basis.

The combined operating and capital costs were then increased by 15% for overhead, the total was increased by a further 15% to include minor hauler cost; this was included in the original Stage 2B analysis and refers to the costs associated with the large number of Halton citizens and small businesses taking their own waste to the landfill site. Although these account for a small amount of waste, there are a significant number of trips involved (approximately 15,000 in 1983). The percentage which minor

---

[4] 8 minutes at a transfer station, where applicable.

hauler costs represent of major hauler costs was reviewed as part of the Stage 2C analysis. It was reduced significantly (from 40% to 15%) due to a redistribution in between major and minor haulers, as well as the anticipated impact of the container stations which should reduce the number of small loads being transported to the landfill site. In addition, the major hauler costs have been increased (largely due to the increased waste tonnage) and, consequently, the minor hauler costs represent a lower proportion of the total.

The issue of transfer stations and container stations was investigated further in this stage to determine their role (if any) in Halton's future solid waste management system. Appendix E describes the additional research which was undertaken in this area. The Region currently has four container stations, one in each of the municipalities. These accept small loads of waste up to 150 kg. They provide a convenient service to ratepayers; and further, container stations would tend to reduce the number of vehicles at the landfill and possibly the amount of roadside litter. Container stations should continue to form part of Halton's solid waste management system, regardless of which Site is selected. Since they will not affect the rating of the six Site Plan Areas, a lump sum annual cost has been included in Site Operating Costs (Appendix C) to cover the cost of container station operations.

In the case of transfer stations, several general advantages were identified. These were reviewed by the study team to assess their importance in the Halton situation as follows:

. Reduction in Traffic

In the Transportation Assessment Technical Report,traffic conflicts were not identified as a significant concern. With the exception of Site E, all Site Plan Areas are located on arterial roads or Provincial Highways. Existing and projected traffic volumes for these routes indicate that the roadways can adequately handle the anticipated increase in truck traffic due to landfilling. Haul routes and access to Site E involve the use of

some local roads, resulting in potential conflict with local traffic. However, the use of transfer stations would not improve the ranking of Site E, since the potential traffic conflict on local roads will exist despite reduced truck traffic.

. Reduction in Traffic Noise

Barman, Coulter and Swallow Associates have concluded that the threshold of traffic volume required to produce a noise impact would be 5,000 AADT on a daily basis, or 7,500 AADT on an hourly basis. The proposed haul routes for the sites, with minor exceptions, are currently at these traffic volume levels and, therefore, the noise impact along landfilling is not considered a problem. Accordingly, establishment of transfer station(s), with the attendant reduction in haul vehicles, is not useful as a mitigating measure and would not affect the ranking of the sites.

. Reduction in Roadside Litter

The establishment of container stations to handle small loads (as discussed above) should have some impact on the amount of roadside litter, as these stations provide a convenient opportunity to dispose of small loads of waste, rather than haul these loads longer distances to the landfill itself. There is no information on the actual effect of transfer stations in reducing litter from haul vehicles.

. Reduction of Negative Property Value Impact Along Haul Routes

Section 7.5 considers possible property value impact on haul routes for the Site Plan Areas. With the exception of Site E, the haul routes and access points are all on major arterial roads or Provincial highways. Because existing traffic levels are already significant, there is unlikely to be any impact on property values. For Site E, there are a few residential and business properties which may be affected, although the potential impact based on the assumptions described in Section 7.5 is approximately

$100,000. In light of the size of the impact relative to the significant costs associated with a transfer station operation (discussed below), it would be very difficult to justify transfer station(s).

. Reduction in Social Impact

On the issue of reducing social impact by lowering the number of vehicles travelling to the landfill site, Myra Schiff Consultants indicate that the presence of the landfill site itself is the overwhelming source of impact. Reduction of vehicles would not reduce that impact to any measurable degree and, thus, the inclusion of transfer stations would not affect the ratings.

. Increase in User Convenience

A significant increase in user convenience can be achieved at a lower cost by the establishment of container stations. Similarly, if transfer stations were put in place with rates low enough to attract significant waste volumes, they would affect all sites relatively equally and would not have any impact on rating of the Site Plan Area.

Offsetting any advantages of transfer stations are the issues of impacts and costs. Transfer stations, themselves, can produce negative impacts for the surrounding area similar to those of a landfill site. These potentially include, among other elements, traffic, noise, and vermin. From a cost perspective, haul costs must be reduced in order to justify the transfer station's existence. The Stage 1 Report concluded that haul times must exceed 80 minutes round trip, including waiting time, to justify a station economically under the most optimal circumstances. Further analysis and updating altered this figure only marginally to 87 minutes as set out in Appendix E.

Accordingly, there is only one situation in which a transfer station can potentially be justified in this analysis. For Site F, costs for a transfer station have been included for Halton Hills waste only, on the basis that:

- This is the only circumstance in which haul times exceed 33-36 minutes one way; and they do so by a margin of up to 10-13 minutes.
- A temporary station currently exists in Halton Hills and will have been in existence for four years prior to the opening of the new landfill site; since the current Regional landfill site is adjacent to Site F, there is an obvious precedent within the Region for considering a transfer station in this instance.

Cost assumptions for the transfer station are outlined in Appendix D.

7.5 Property Value Impacts

The Stage 2B Report included an allowance for possible property value impacts emphasizing that "any impacts which may occur will be dependent upon the nature of the site, land use in the area and the local real estate market characteristics". It is impossible to predict in advance if impacts will occur and, if so, to what degree and for what duration. The experience of various public agencies and Ministries (as documented in studies and research) on several types of public facilities does not present a clear and consistent picture but does provide insight into possible impacts. Accordingly, in the Stage 2C analysis, a range has been included which would appear to encompass the spectrum of possibilities. For rural residential properties, that range is a minimum of 0% to a maximum of 20% reduction in property values and, for farm properties, a minimum of 0% (no impact) to a maximum of 10% reduction in property values. For businesses which could potentially be impacted, a potential loss of value range was used, from $0 to $50,000, based on a review of the nature of the enterprises involved. This range was not altered to encompass possible value gains produced by the increased traffic and activity.

The number of houses, farms and businesses in the study area was provided by Walker, Wright, Young Associates Limited.

The average property (market) value for residences and farms in each study area was developed primarily based on average valuations provided in the Region's Property Management Division Report as follows:

- Rural Residential - $130,000 for all study area properties.
- Farm - $600,000 for properties in the vicinity of Sites A, B, C and F and $420,000 for properties in the vicinity of Sites D and E.

The total 1984 property value impact range for each Site Plan Area was calculated and treated as a potential cost (in this case, one which may be realized at some point by the individual property owners) in evaluating the Site Plan Areas.

With respect to potential property value impact on haulage routes, all Site Plan Areas except Site E use major arterial roads or Provincial highways for access. According to the Transportation Assessment Technical Report, these roads already carry substantial traffic volumes. There is unlikely to be any impact on property values along these routes. However, for Site E, there are a few residential and business properties which may be affected (Technical Report prepared by Walker, Wright, Young Associates Limited). A similar calculation range of 0% to 20% possible reduction in property value for residential dwellings (assumed at an average value of $130,000) and $0 to $50,000 for the business has been included for the two residential properties and one business on the haul route, but not part of the study area for Site E.

7.6 Mitigation Measures

Possible measures to eliminate or reduce negative impacts for various sites have been identified by study team members and described in the appropriate Technical Reports. Major mitigation measures which have been incorporated into the capital and operating cost assumptions include:

- Special earthwork procedures to reduce noise impact.
- Leachate collection system and treatment (including connection to sanitary sewer line).
- Buffering and landscaping.
- Monitoring.

- Road upgrading requirements and intersection improvements for all sites (including a new access road for Site A).

- Transfer Station.

- Container Stations.

Several other mitigation measures have been recommended in other Technical Reports. However, for the most part, they are common to all sites and will not affect the site selection process. Accordingly, they will form part of the costing in the final design stage.

8.0 TOTAL SITE PLAN AREA COSTS

The following tables (Tables 1 to 6) outline the present value of developing each of the six Site Plan Areas as a landfill. The PV (present value) figure is as of January 1, 1985. All costs are assumed to occur at the end of the year. To simplify the analysis, the cash flow covers the period from 1985 to 2008 with the landfill assumed to open on January 1, 1987 and close by the end of 2008. The 24 years incorporate the period when virtually all expenditures in connection with the landfill site will be made. It is recognized that there were study costs prior to that date as well as perpetual care costs including leachate treatment costs which may continue for a period of approximately 30 years after the closing of the site. In cases other than leachate treatment, these costs will be almost identical for all Site Plan Areas and, thus, their inclusion will not assist in evaluating the sites. For leachate treatment costs beyond the closure of the site,[5] the range of figures between the highest cost site and the lowest is less than $50,000 in 1984 dollars (See Appendix C). In relation to other costs (such as operating, haul costs, etc.), this amount is not sufficient to influence the outcome of the analysis, considering that the expenditures will occur over an extended period of time.

As stated previously, the objective in this cash flow analysis is to focus on cost components which will differentiate among the sites. There are a number of other possible cost items, such as for mitigating measures, that are common to all sites, which have not been included. Full costing will be undertaken once a preferred site is selected and detailed design work is underway.

Each of the Site Plan Areas has unique features which affect the cost figures to a greater or lesser degree. These features are outlined in other Technical Reports dealing with Transportation, Natural Environment,

---

5 Leachate treatment costs will gradually decrease after the site is closed, to the level shown in Appendix C for the first ten years of the site operation.

Land Use, etc. They are also evident in the assumptions documented in Sub-sections 7.1 to 7.6. A summary of the major factors which differentiate the cost of each Site Plan Area is provided below:

. Site Plan Area A

- Operating and capital costs for new access road.
- Higher property value impact due to land uses in the study area.

. Site Plan Area B

- Capital cost for liner.
- Additional operating cost due to difficulty of working with liner.
- Additional operating cost for leachate pumping due to need for dewatering.
- Higher property acquisition costs due to larger numbers of parcels (and buildings) on-site.

. Site Plan Area C

- Capital cost for liner.
- Additional operating cost due to difficulty of working with liner.
- Higher property value impact due to land use characteristics around site.
- Additional earthwork cost due to need for shale excavation.
- Additional operating cost for leachate pumping due to need for dewatering.

. Site Plan Area D

- Higher haul costs due to lower accessibility.

. Site Plan Area E

- Possible impact on property values along haul route.
- Additional capital cost for road improvements (over and above requirements for other sites) due to need to upgrade local roads.
- Higher haul costs due to lower accessibility.

. Site Plan Area F

- Additional earthwork cost due to shale excavation.
- Transfer station for Halton Hills waste.
- Range of property valuations considering as well as excluding the current application for a private landfill site.
- Inclusion of benefits of developing this site with respect to use of existing facilities at the Region's current landfill site (weigh scales, buildings, access road, container station, etc.) and clean-up of a neighbouring closed landfill site (Bayview, where the value was netted from costs).

TABLE 1

CASH FLOW ANALYSIS FOR SITE PLAN AREA A
(Present Value as of January 1, 1985)

Year	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL	
1985	2008000	2142000						4150000	4150000
1986		4170000	427000			0	4019000	4597000	8616000
1987				2022593	2071724			4094317	4094317
1988				2296126	2402073			4698199	4698199
1989				2568179	2714243			5282422	5282422
1990				2772312	2900856			5673168	5673168
1991		1190000		2992281	3101860			7284141	7284141
1992				3234168	3326123			6560291	6560291
1993				3495050	3567969			7063019	7063019
1994				3776386	3828799			7605186	7605186
1995				4079748	4395447			8475194	8475194
1996				3916474	3479690			7396163	7396163
1997				4029863	2913038			6942901	6942901
1998				4346817	3120057			7466873	7466873
1999				4688186	3343242			8031428	8031428
2000				5055769	3583779			8639548	8639548
2001				5451614	3843115			9294729	9294729
2002				5888213	4665300			10553513	10553513
2003				6358866	4989319			11348185	11348185
2004				6866227	5338512			12204739	12204739
2005				7413014	5714725			13127739	13127739
2006				8002267	6120198			14122465	14122465
2007				8628332	6545892			15174224	15174224
2008		178000		3879817	2923328			6981146	6981146
PRESENT VALUE	1792857	5786821	340402	21818543	19944487	0	3203922	49683110	52887032

TABLE 2

CASH FLOW ANALYSIS FOR SITE PLAN AREA B
(Present Value as of January 1,1985)

Year	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUC-TION COSTS	SITE OPERAT-ING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL	
1985	3514000	3069000						6583000	6583000
1986		34860000	69000			0	3455000	34929000	38384000
1987				2154966	2071724			4226690	4226690
1988				2448333	2402073			4850406	4850406
1989				2743567	2714243			5457810	5457810
1990				2962719	2900856			5863575	5863575
1991		1680000		3198931	3101860			7980792	7980792
1992				3458932	3326123			6785055	6785055
1993				3739428	3567969			7307397	7307397
1994				4041999	3828799			7870799	7870799
1995				4368344	4247085			8615429	8615429
1996				4174765	3479690			7654455	7654455
1997				4215163	2913038			7128201	7128201
1998				4549010	3120057			7669067	7669067
1999				4908707	3343242			8251949	8251949
2000				5296160	3583779			8879940	8879940
2001				5713552	3843115			9556667	9556667
2002				6174675	4665300			10839975	10839975
2003				6671960	4989319			11661278	11661278
2004				7208241	5338512			12546753	12546753
2005				7786412	5714725			13501137	13501137
2006				8409718	6120198			14529916	14529916
2007				9071720	6545892			15617612	15617612
2008		178000		4081209	2923328			7182538	7182538
PRESENT VALUE	3137500	31302031	55006	23137412	19901837	0	2754305	77533786	80288091

TABLE 3

CASH FLOW ANALYSIS FOR SITE PLAN AREA C
(Present Value as of January 1, 1985)

Year	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL	
1985	2434000	3161000						5595000	5595000
1986		36086000	69000			0	4378000	36155000	40533000
1987				2243881	2071724			4315605	4315605
1988				2547752	2402073			4949825	4949825
1989				2849946	2714243			5564188	5564188
1990				3076544	2900856			5977400	5977400
1991		1818000		3320724	3101860			8240584	8240584
1992				3589250	3326123			6915373	6915373
1993				3878869	3567969			7446838	7446838
1994				4191200	3828799			8020000	8020000
1995				4527989	4395447			8923436	8923436
1996				4309550	3479690			7789239	7789239
1997				4316054	2913038			7229092	7229092
1998				4656964	3120057			7777021	7777021
1999				5024217	3343242			8367459	8367459
2000				5419757	3583779			9003536	9003536
2001				5845800	3843115			9688915	9688915
2002				6316180	4665300			10981480	10981480
2003				6823370	4989319			11812689	11812689
2004				7370250	5338512			12708762	12708762
2005				7959762	5714725			13674487	13674487
2006				8595203	6120198			14715400	14715400
2007				9270189	6545892			15816080	15816080
2008		178000		4169507	2923328			7270835	7270835
PRESENT VALUE	2173214	32423958	55006	23878799	19944487	0	3490115	78475464	81965579

TABLE 4

CASH FLOW ANALYSIS FOR SITE PLAN AREA D
(Present Value as of January 1,1985)

Year	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL	
1985	1777000	2223000						4000000	4000000
1986		5694000	86000			0	2761000	5780000	8541000
1987				2011519	2223030			4234548	4234548
1988				2284277	2578420			4862696	4862696
1989				2555500	2914504			5470004	5470004
1990				2758746	3115912			5874658	5874658
1991		2195000		2977765	3332875			8505640	8505640
1992				3218636	3574928			6793564	6793564
1993				3478430	3835985			7314415	7314415
1994				3758604	4117560			7876163	7876163
1995				4060720	4766674			8827395	8827395
1996				3896115	3874477			7770591	7770591
1997				3936831	3244172			7181003	7181003
1998				4247272	3475379			7722651	7722651
1999				4581673	3724656			8306329	8306329
2000				4941800	3993326			8935126	8935126
2001				5329667	4283008			9612675	9612675
2002				5757730	5189132			10946863	10946863
2003				6219249	5550868			11770118	11770118
2004				6716837	5940743			12657580	12657580
2005				7253166	6360819			13613985	13613985
2006				7831231	6813599			14644829	14644829
2007				8445323	7289028			15734351	15734351
2008		178000		3798228	3255851			7232078	7232078
PRESENT VALUE	1586607	7528677	68559	21559835	21728251	0	2201052	52471929	54672981

TABLE 5

CASH FLOW ANALYSIS FOR SITE PLAN AREA E
(Present Value as of January 1,1985)

Year	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL	
1985	1118000	2172000						3290000	3290000
1986		4790000	740000			0	1559000	5530000	7089000
1987				2005259	2569287			4574546	4574546
1988				2277578	2980769			5258347	5258347
1989				2548333	3370100			5918434	5918434
1990				2751077	3603820			6354898	6354898
1991		1622000		2969560	3855606			8447166	8447166
1992				3209856	4136499			7346355	7346355
1993				3469036	4439466			7908502	7908502
1994				3748552	4766265			8514816	8514816
1995				4049965	5309232			9359196	9359196
1996				3884606	4484208			8368814	8368814
1997				3907806	3755694			7663500	7663500
1998				4216215	4024368			8240583	8240583
1999				4548442	4314060			8862502	8862502
2000				4906243	4626312			9532554	9532554
2001				5291621	4963005			10254626	10254626
2002				5717021	6004182			11721203	11721203
2003				6175690	6424431			12600121	12600121
2004				6670229	6877411			13547640	13547640
2005				7203295	7365523			14568819	14568819
2006				7777869	7891678			15669547	15669547
2007				8388226	8444241			16832467	16832467
2008		178000		3772771	3772677			7723448	7723448
PRESENT VALUE	998214	6503282	589923	21462723	25141274	0	1242825	54695416	55938242

TABLE 6

CASH FLOW ANALYSIS FOR SITE PLAN AREA F
(Present Value as of January 1, 1985)

Year	PROPERTY ACQUISITION LOW	PROPERTY ACQUISITION HIGH	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COSTS	PROPERTY VALUE IMPACT LOW	PROPERTY VALUE IMPACT HIGH	TOTAL LOW	TOTAL HIGH
1985	2247000	6206000	2604000						4851000	8810000
1986			7586000	69000			0	554000	7655000	8209000
1987					2454638	2570237			5024875	5024875
1988					2758414	2980958			5739372	5739372
1989					3062827	3372528			6435355	6435355
1990					3301586	3613444			6915029	6915029
1991			1877000		3558604	3873234			9308838	9308838
1992					3840133	4162894			8003027	8003027
1993					4143433	4475613			8619046	8619046
1994					4470156	4813228			9283384	9283384
1995					4822081	5481809			10303890	10303890
1996					4534536	4574462			9108998	9108998
1997					4468516	3855816			8324332	8324332
1998					4816175	4158418			8974593	8974593
1999					5190400	4464537			9654937	9654937
2000					5593138	4794775			10387912	10387912
2001					6026599	5151135			11177734	11177734
2002					6503447	6052431			12555878	12555878
2003					7017166	6494001			13511167	13511167
2004					7570608	6970565			14541174	14541174
2005					8166701	7484703			15651404	15651404
2006					8808713	8039515			16848228	16848228
2007					9491229	8623421			18114650	18114650
2008			178000		4263602	3859511			8301113	8301113
PRESENT VALUE	2006250	5541071	9233299	55006	25213371	25409342	0	441645	61917268	65893735

9.0 PUBLIC VS. PRIVATE LANDFILL OPERATION

There are a variety of different levels of involvement for the public and private sectors to take in the provision of waste disposal facilities. These range from:

A. Regional ownership of the landfill and operation via its own staff, such as is done in Peel Region (with various construction projects contracted out from time to time).

B. Regional ownership of the landfill, with the operation fully contracted out to a private firm, as is the case in Halton Region.

C. Regional ownership of the facilities with the operation of most elements in the waste disposal system (incineration, landfill, transfer stations) contracted out to the private sector as is the case in Hamilton-Wentworth.

D. Private ownership and operation of a landfill site, as is the case of the Walker Brothers' site in Niagara Region.

The question arises at this stage in the site selection process as to whether one of these approaches is necessarily better than the others and, if so, whether this fact should influence the selection of one or more of the Site Plan Areas.

The choice is essentially between private ownership in Option (D) and public ownership in (A), (B) or (C). The introduction of private contractors in (B) or (C) can presumably be arranged on a short-term basis, with virtually full control maintained by the Region, including the ability to change contractors or to deprivatize some or all of the operations involved. Private vs. public ownership would normally be characterized by the following general differences, unless modified by the specifics of a particular contractual situation:

. Under public ownership, the Region would be required to finance the site purchase, facility design and construction and related costs. The capital cost involved is highly variable, but is likely to be in excess of $7,000,000 (1984 $). A good portion of this amount would undoubtedly

have to be debentured with a component of the tipping fee revenue covering the debt carrying costs. This would, however, consume an additional portion of the Region's debt capacity which is presently very near the maximum permissible limit.

Under private ownership, these costs would be financed by the proponent based on tipping fee revenues from the area municipalities and private carriers. The Region's contractual agreement with the proponent with respect to waste volumes may well be such that a long-term financial agreement was not involved and therefore Halton's debt capacity would not be affected. Such an agreement may, however, place the Region in a difficult position by compromising its serious efforts to reduce landfilling volumes via source separation and energy from waste processing, since the private owner would be interested in the largest possible volumes of waste.

In addition, a private proponent is required to make fixed contributions (presumably financed via a tipping fee increment) to a Ministry of Environment (M.O.E.) Perpetual Care Fund; whether it is ultimately of an appropriate size or not, would not be within Regional control.

. Under public ownership, the Region could proceed to implement its plans using the power of expropriation. The difference between the Environmental Assessment Act and the Environmental Protection Act and their applicability to one body or another, is of much less relevance, given the current advanced state of the Region's site selection process. Private Sector assembly of the full site required, might be problematic, as would Regional intervention in order to provide assistance.

On the other hand, the existence of a private proponent with land ownership could be of considerable benefit in the resolution of property purchase and related disputes.

. Under public ownership, the Region would not need to reach a complex contractual agreement with a proponent or to monitor his performance, renegotiate such agreements over time or take action in the event of problem created by the proponent. The extent of this problem could vary with the proponent's experience in landfill and his approach to doing business.

  By the same token, with private ownership, the Region would not have day to day operating responsibility and would, to some degree, be distanced from the problem and from liability, in the event of legal and other difficulties. This would likely be perceived as a significant disadvantage to neighbours of the landfill operation, who are concerned with public assurances that public health and safety problems will be avoided and everything possible done to eliminate or at least minimize areas of nuisance. A private operation would probably not be perceived as being as responsible and responsive to public opinion in this respect. Indeed, the question may be raised as to whether landfill is a valid candidate for privatization in Halton, given the strong public concerns expressed about it and the number of potentially negative impacts.

. Private ownership may carry with it less control and predictability over the use and time span of the landfill; for example, in terms of the acceptance of inert building materials or waste generated outside of the Region.

  The possibility of a private site operating in "competition" with a Regional site could also negatively affect Regional planning assumptions and investment decisions. However, this could occur regardless of the Site selected.

The cost analysis contained in this report has been done on the assumption that the Region will own any landfill facility which is provided. Overall, there is nothing in the review of general options to suggest that private ownership represents a preferable alternative for this particular type of facility. The fact that much of one particular site (Site F) is owned by a

company seeking to operate a landfill in Halton does not alter the desirability or lack thereof of that particular site. It may well affect the ultimate purchase price of the site, but that consideration has been factored into the analysis using a price range. The same funding is true of any of the other five sites, should a similar situation arise.

If Site F is selected as the preferred site, it may be necessary to evaluate the private sector ownership option in greater detail at that time. While the specifics of negotiations and agreements could conceivably alter our general findings herein, public ownership of the landfill will continue to represent a basic assumption underlying our economic analysis.

10. DISTRIBUTION OF COST BURDEN

The Region of Halton, the area municipalities and the private sector will all bear a portion of the landfill costs, estimated for each component as follows:

. Property Acquisition:	Region - 100%
. Site Capital Costs:	Region - 100%
. Road Reconstruction Costs:	Region - 100%
. Site Operating Costs: (including Container Station Operations)	Region - 100%
. Haul Costs:	Local Municipalities - 45% Private Sector - 55% (Region may also bear a share of the costs via transfer stations.)
. Property Value Impact:	Private Sector - 100% (Region may also bear a share of the costs if it were required under the terms of the Expropriation Act, for example. The Region's Compensation Policy is attached as Appendix F.)

Table 7 shows the distribution of the cost burden for the six alternative landfill Sites based on the components listed above. The results are as follows:

- Region - From the Regional perspective, Sites A, D and E would be the lowest cost alternatives. Site F's costs are approximately 30% higher while costs for Sites B and C are approximately 100% higher.

TABLE 7

DISTRIBUTION OF COST BURDEN FOR ALTERNATIVE LANDFILL SITE PLAN AREAS IN HALTON

($000,000 PV as of January 1, 1985)

SITE PLAN AREAS	REGION	INDEX	LOCAL MUNICIPALITIES	INDEX	PRIVATE SECTOR	INDEX	TOTAL
A	29.8	101	9.0	100	10.9-14.1	100-103	49.7-52.9
B	57.6	195	9.0	100	10.9-13.7	100-100	77.5-80.3
C	58.6	198	9.0	100	10.9-14.4	100-105	78.5-82.0
D	30.8	104	9.8	109	11.9-14.1	109-103	52.5-54.7
E	29.6	100	11.3	126	13.8-15.0	127-109	54.7-55.9
F	36.5-40.0	123-135	11.4	127	14.0-14.5	128-106	61.9-65.9

SOURCE: Tables 1 to 6 and text

11.0 CONCLUSION

Table 8 summarizes the findings of the economic analysis for Stage 2C, showing the present value (as of January 1985) for each cost component. The ranking of the Site Plan Areas from lowest to highest cost (using the midpoint in the cost range) is as follows:

	$000,000	Index
A	51.3	100
D	53.6	104
E	55.3	108
F	63.9	125
B	78.9	154
C	80.3	157

Costs for Sites A, D and E are the lowest and are all relatively similar. Site F's costs are 16%-25% higher than the three low impact sites with an additional cost of $9-13 million dollars. Sites B and C both have significantly higher costs, approximately $25-29 million or 43%-57% higher than the least expensive sites.

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

TABLE 8

SUMMARY OF COST ANALYSIS FOR HALTON ENVIRONMENTAL

ASSESSMENT STAGE 2C

($000,000 PRESENT VALUE AS OF JANUARY 1, 1985)

SITE PLAN AREA	PROPERTY ACQUISITION	SITE CAPITAL COSTS	ROAD RECONSTRUCTION COSTS	SITE OPERATING COSTS	HAUL COST	PROPERTY VALUE IMPACT	TOTAL
A	1.8	5.8	0.4	21.8	19.9	0-3.2	49.7 - 52.9
B	3.1	31.3	0.1	23.1	19.9	0-2.8	77.5 - 80.3
C	2.2	32.4	0.1	23.9	19.9	0-3.5	78.5 - 82.0
D	1.6	7.5	0.1	21.6	21.7	0-2.2	52.5 - 54.7
E	1.0	6.5	0.6	21.5	25.1	0-1.2	54.7 - 55.9
F	2.0-5.5	9.2	0.1	25.2	25.4	0-0.5	61.9 - 65.9

SOURCES: Tables 1 to 6

APPENDIX A

Annual Landfill Waste Tonnage

APPENDIX A

Annual Landfill Waste Tonnage

In the "Review and Supplement to Stage 2B Final Report", November 1984, the total landfill volume requirement for Halton Region was estimated to be 11.32 million cubic yards. This would accommodate waste for the full long term forecast period from June 1988 to June 2008 as well as for 17 months of the interim forecast period (January 1987 to June 1988).

In order to complete several components of the cost analysis, calculation of annual waste tonnage to be landfilled was necessary. The figures are shown (in imperial tons) in the first column on Table 9 following. They represent a combination of: the most probable waste forecast and a tonnage equivalent to the contingencies for high population and high waste per capita, new wastes and, where appropriate, allowance for downtime of the Energy from Waste (EFW) facility(ies). Tonnage of ash residue and non-combustibles have been included as well for the years in which the EFW facility(ies) will operate (after June 1996).

The impact of the opening of the EFW facility(ies) produces the reduction in the landfill waste quantity figures in the post-1995 period. Although EFW facility(ies) is assumed to handle 50% of the waste, the landfill waste quantities do not equal 50% of the total since the landfill must be sized to handle the downtime contingency and residues as well.

The total landfilled waste figure of 5,169,746 tons shown in Table 9 is consistent with the landfill volume requirements (of 11.32 million cubic yards) from the Stage 2B Review and Supplement Report, excluding the volume contingency which would not affect total waste tonnage. The assumed landfill density was 1,000 lbs. per cubic yard.

The second column of figures on Table 9 shows the most probable waste forecast plus the contingency, but excluding the plant residue. This annual tonnage was used in the haul cost analysis; costs to transport the EFW

TABLE 9

ANNUAL WASTE TONNAGE TO LANDFILL SITE
OVER FORECAST PERIOD
(TONS)

	MOST PROBABLE FORECAST + EFW RESIDUE + CONTINGENCY*	MOST PROBABLE FORECAST + CONTINGENCY*
1987	220,017	220,017
1988	242,398	242,398
1989	260,045	260,045
1990	263,654	263,654
1991	267,241	267,241
1992	271,437	271,437
1993	275,608	275,608
1994	279,754	279,754
1995	283,875	283,875
1996	239,565	220,620
1997	208,016	175,059
1998	211,022	177,588
1999	214,011	180,104
2000	216,979	182,602
2001	219,931	185,086
2002	223,548	188,130
2003	227,143	191,155
2004	230,719	194,165
2005	234,271	197,154
2006	237,801	200,125
2007	240,892	202,726
2008 (5 months)	101,819	85,687
TOTAL	5,169,746	4,744,230

*excludes volume contingency which would not affect total waste tonnage

SOURCE: Calculated from data contained in the "Review and Supplement to Stage 2B", November, 1984

residue from that facility(ies) to the landfill site were not included as they were considered to be an EFW-related cost and are indeterminate at this time.

The Transportation Assessment Technical Report prepared by Giffels Associates Limited contains a table showing distribution of landfilled waste among 10 waste zones in the Region (Table 6). It should be noted that these figures are in metric tonnes, not imperial tons as Table 9. The distribution of waste among the zones is based on population forecasts provided by the Regional Planning and Development Department in July 1983, and subsequently confirmed in August 1984.

APPENDIX B

Site Plan Area Development Costs

TABLE 10

DEVELOPMENT COSTS FOR SITE PLAN AREAS
(1984 $)

	A	B	C	D	E	F
	$	$	$	$	$	$
1. Earthwork; including soil and shale excavation, stockpiling and backfilling, spreading and compaction of final cover	959,000	920,000	1,432,000	934,000	930,000	4,631,000
2. Leachate collection system; including perforated pipe, headers, pumphouse (complete with pumps, controls and power), and main to sanitary sewer line or treatment plant	1,164,000	744,000	933,000	2,640,000	1,735,000	1,035,000
3. Perimeter dewatering system; including perforated pipe, headers, pumphouse (complete with pump, controls, and power), and piping to nearest surface watercourse	--	857,000	232,000	--	--	--
4. Impermeable liner; including liner and granular bedding and cover	--	22,050,000	22,979,000	--	--	--
5. Perimeter and litter fencing (including gates)	170,000	176,000	175,000	213,000	199,000	182,000
6. Weigh scales (allowance)	250,000	250,000	250,000	250,000	250,000	--
7. On-site buildings, drainage, roads, etc. (allowance) including services	400,000	400,000	400,000	400,000	400,000	--
8. Monitoring instrumentation (allowance)	50,000	50,000	50,000	50,000	50,000	35,000
9. Relocation of Bell Telephone Cable	--	--	--	--	--	32,000
10. Landscaping for Buffer	248,000	388,000	293,000	368,000	349,000	160,000
11. Rehabilitation (seeding only)	35,000	35,000	35,000	35,000	35,000	35,000
SUB-TOTAL CONSTRUCTION	3,276,000	25,870,000	26,779,000	4,890,000	3,948,000	6,110,000
12. Design and Supervision	1,002,000	2,736,000	2,909,000	1,156,000	1,059,000	1,869,000
SUB-TOTAL CONSTRUCTION AND DESIGN	4,278,000	28,606,000	29,688,000	6,046,000	5,007,000	7,979,000
13. Contingency (15% of above)	642,000	4,291,000	4,453,000	907,000	751,000	1,197,000
14. Approval Costs	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
TOTAL	6,420,000	34,397,000	35,641,000	8,453,000	7,258,000	10,676,000

SOURCE: All Costs except Approval Costs - Hydrology Consultants
Approval Costs - Walker, Wright, Young Associates Ltd.

APPENDIX C

Site Operating Cost Assumptions

APPENDIX C

Site Operating Cost Assumptions

N.B. All costs are in 1984 dollars

1. Regional Administration

   All sites - $160,000 per annum

2. Per Ton Costs (includes placing and compaction of wastes, earthworks, placement of daily cover, scale house operation, maintenance of access roads, dewatering and surface drainage, litter and nuisance control, etc.)

   Sites A, D, E, F - $4.50 per ton per annum

   Sites B, C - $5.00 per ton per annum (additional cost due to extra care required in working with liner as per information from Hydrology Consultants)

3. Additional Earthworks Costs (due to shale excavations)

   Site C - $1,280,000 over site life (converted to an annual cost based on waste volume)

   Site F - $6,260,000 over site life (converted to an annual cost based on waste volume)

4. Additional Road Operating Costs (for new access road)

   Site A - $3,200 per annum

5. Leachate Pumping Costs

   Sites A, D, E - $1,000 per annum

   Sites B, C - $2,000 per annum for first 10 years
   - $1,000 per annum for remainder

   Site F - No cost due to gravity feed

6. Leachate Treatment Cost

	Annual Cost for First 10 Years $	Annual Cost for Years 10 - 21 $	Annual Cost for Year 50* $
Site A	41,245	116,435	41,245
Site B	40,150	91,250	40,150
Site C	37,595	85,410	37,595
Site D	35,405	81,030	35,405
Site E	30,295	68,985	30,295
Site F	30,660	69,350	30,660

*This applies if the site closes after 21 years.

7. All Other Items (Includes monitoring, emergency hours, contingency, maintenance by Regional staff, property taxes, operation of Container Stations, etc.)

All sites - $456,000 per annum

TRANSFER STATION COST ASSUMPTIONS (1984 $)

Data on transfer station costs is based on current proposal for permanent transfer station in Halton Hills.

- Cost per ton minute for transfer vehicles - 6¢/ton/minute
- Operating Costs - $9.56 per ton
- Capital Costs
  - Building and Equipment - $320,000
  - Annual Payment, Assuming 20 Year Amortization @ 13% - $45,550 per annum
  - Land Lease - $14,000 per annum.

APPENDIX D

Assumptions for Haul Cost Analysis and Transfer Stations

TABLE 11

SAMPLE OF BASIS FOR HAUL COST CALCULATIONS

SITES A, B, C: 1988 - OPERATING COSTS

ZONES	GAS AND MAINTENANCE DISTANCE* X 5¢/KM/TON		LABOUR TIME** X 6¢/TON/MINUTE		TOTAL COST/TON	% OF TOTAL WASTE
	Km	$	Minutes	$	$	%
1	57.4	2.87	59.6	3.58	6.45	2
2	43.8	2.19	50.52	3.03	5.22	39
3	44.2	2.21	52.88	3.17	5.38	1
4	19.2	0.96	31.46	1.89	2.85	<1
5	14.4	0.72	33.48	2.01	2.73	37
6	4.4	0.22	18.78	1.13	1.35	2
7	36.6	1.83	44.74	2.68	4.51	6
8	59.2	2.96	59.42	3.57	6.53	1
9	66.6	3.33	69.5	4.17	7.50	3
10	49.4	2.47	58.14	3.49	5.96	9

TOTAL WEIGHTED AVERAGE $4.35 (1984 $/TON)

*Km are doubled to reflect two way trip times

**Times are doubled to reflect two way trip times + 15 minutes drop-off at landfill site

TABLE 12

SAMPLE OF BASIS FOR HAUL COST CALCULATIONS

SITES A, B, C: 1988 - CAPITAL COSTS

ZONES	TIME (MINUTES)*	COST PER TON @ 3¢/TON/MIN. $	% OF TOTAL WASTE
1	59.6	1.79	2
2	50.52	1.51	39
3	52.88	1.59	1
4	31.46	0.94	<1
5	33.48	1.00	37
6	18.78	0.56	2
7	44.74	1.34	6
8	59.42	1.78	1
9	69.5	2.09	3
10	58.14	1.74	9

TOTAL WEIGHTED AVERAGE $1.34 (1984$/TON)

*Times are doubled to reflect two way trip times + 15 minutes drop-off

APPENDIX D

TRANSFER STATION COST ASSUMPTIONS (1984 $)

N.B. Date on transfer station costs based on current proposal for permanent transfer station in Halton Hills.

Cost per ton minute for transfer vehicles - 6¢/ton/minute

Operating Costs - $9.56 per ton

Capital Costs - Building and Equipment - $320,000

- Annual Payment, Assuming 20 Year Amortization @ 13% - $45,550 per annum

- Land Lease - $14,000 per annum.

APPENDIX E

Summary of Transfer Station Research

APPENDIX E

Summary of Transfer Station Research

1. Background to the Halton Situation

The Region of Halton currently has a temporary, open air transfer station operating in Halton Hills, on Armstrong Avenue in Georgetown. The station opened in January, 1983, following the closure of the Oakville landfill site and the consolidation of the Region's operation at the Burlington site. The station serves municipal collection vehicles in Halton Hills, private haulers and citizens. It also provides a bin for recycled newspapers. The MOE operating permit for the temporary transfer station now extends for a further three year period to coincide with the permit allowing the extension of the Burlington Landfill Site. An application was made for a permanent indoor transfer station (prior to the establishment of the temporary station). However, a decision was deferred on this application pending the results of the Landfill Environmental Assessment Study.

The Halton Hills transfer station[1] is open six days a week from 7:00 a.m. to 6:00 p.m. for haulers and from 8:30 a.m. to 4:30 p.m. on weekdays and from 8:00 a.m. to 3:00 p.m. on Saturdays for members of the public. The tonnage of waste handled at the transfer station over the last year is shown in Table 13.

There were no weigh scales on-site prior to August 1983 so that precise weights of waste are not available before that date. The monthly amount of waste handled at the station averaged 1,690 tons although in recent months the tonnage has been increasing to over 2,000 tons per month. The transfer station operator estimates that an additional 400-500 tons a month is bypassing the station because of the high cost; some of this waste may be hauled directly to the Halton landfill while, in other cases, it may be disposed of illegally in landfill sites in surrounding areas. Table 14

---

1 Information on the existing and proposed Halton Hills transfer station from an interview with John Gillisen of Leferink Disposal on August 30, 1984.

TABLE 13

Tonnage of Waste Processed at the Georgetown Transfer Station

	Month	Tons	% of Region's Landfilled Waste
1983	August	1,489	8.7
	September	1,556	9.6
	October	1,392	8.9
	November	1,568	9.4
	December	1,332	10.0
1984	January	1,356	10.9
	February	1,378	10.4
	March	1,533	11.4
	April	2,004	11.4
	May	2,394	10.7
	June	2,194	11.5
	July	2,100	11.5

Average over year 1,691 tons per month

SOURCE: Leferink Transfer Limited

TABLE 14

No. of Cars with Loads to 150 Kg Processed at Georgetown Container Station

	Month	Number
1983	August	1,967
	September	1,911
	October	1,923
	November	1,801
	December	1,738
1984	January	1,701
	February	1,930
	March	1,966
	April	2,269
	May	2,294
	June	2,367
	July	2,652

Average over year 2,043 per month

SOURCE: Leferink Transfer Limited

indicates the number of small loads being disposed of at the Halton Hills container station; these average 2,043 per month over the past year with the number increasing in recent months. Over the year, the small loads would account for an estimated 2,500 tons of waste.

The Town of Halton Hills and the private haulers using the transfer station pay a tipping fee which includes both the transfer station costs, transfer haul costs, and the landfill fee. In 1984, this fee was $33 per ton with the landfill tipping fee at $16.33 and the transfer station fee at $16.67 per ton. The Town of Halton Hills received a $1 per ton reduction. The Region pays a per vehicle fee to the operator to cover the container station costs.

The Region has recently added two additional components to their existing waste management system; namely, satellite container stations which provide similar user convenience as transfer stations for residents. The Region has established container stations in both Milton and Oakville to handle waste up to 150 kg loads (for which there is no charge). There are also recycling depots on the sites. The stations are operated three days a week (Tuesday, Thursday and Saturday) from 8:30 a.m. to 4:30 p.m. in the summer and from 9:30 a.m. to 3:00 p.m. in the winter. They are operated by a private contractor (Leferink in Milton and Laidlaw in Oakville) and the containers are emptied each day at the landfill site. The Milton Container Station has been quite popular as it replaced an existing service by the Town. A survey was completed in the week of August 11, 1984, to determine the characteristics of users. The survey indicated that users were split almost equally between rural and urban households. First time users totalled 41% of those surveyed. Comments from users indicated the reason for their visit included the following: "cleaning out garage, too much for garbageman, going away on vacation", and so forth.

2. Transfer Stations in Hamilton-Wentworth[2]

The main components of the solid waste management system in Hamilton-Wentworth are the energy from waste municipal incinerator (SWARU), a 550-acre landfill site and three transfer stations: The largest transfer station has a capacity of 350,000 tons/year and is located in Hamilton; the two smaller transfer stations are located in Dundas and on the Mountain - each have an annual capacity of 130,000 tons. All waste, both municipal and private, is processed through the transfer stations. With very few exceptions, the only trucks entering the landfill site are the transfer vehicles. The Region owns the transfer stations, the landfill site and SWARU, but contracts out the operations to Tricil Ltd. The transfer stations are operating at approximately one-half their design capacity.

The 1984 tipping fee in Hamilton-Wentworth was approximately $20 per ton. The 1984 budgeted operating costs for the solid waste system were approximately $32.00 per ton.

Regional staff indicated that traffic had been a major public concern on the haul routes and at their previous landfill site. That site was located in a developing suburban area. This was a major reason for developing a waste management system where all wastes were processed through transfer stations. Regional staff identified other advantages to their system including some improvement in the ability to regulate unacceptable wastes, opportunities for recycling, and traffic control within the site. However, an examination of the economics of a full transfer station system did not form part of the study process which recommended the system.

---

2 Information on the Hamilton-Wentworth system from an interview with Romeo Palombella of the Region of Hamilton-Wentworth on September 6, 1984.

3. Selected Bibliography on Transfer Stations

"Third Transfer Station Helps Dallas Handle Texas-Size Waste Volume", Waste Age (December 1983)

In order to maintain an efficient waste management system while reducing their landfill sites from eight to two, Dallas has developed a system of several transfer stations feeding a single landfill site. This is an attempt to preserve local haul economies in all parts of the City. The newest transfer station, which handled 300 tons per day, had resulted in a 33 percent reduction in mileage, a 93% decrease in overtime payments, and a 3% increase in revenues. This resulted in a saving of $62,000 per month as compared to City collection operating costs prior to the establishment of the transfer station. The tipping fee for a truck with a capacity of 30 cubic yards or less was $86 at the transfer station and $49 at the landfill site. The article indicated that transfer stations could represent the initial stage in the development of a resource recovery system as one of the Dallas stations is designed for the eventual addition of this type of facility.

"Transfer Centre Serves Oregon Communities" Waste Age (December 1983)

The Metropolitan Service District (Metro) owns an 800 ton a day transfer station which was originally intended as a back-up facility to a proposed incineration facility. The contractor is paid $7 a ton for waste delivered to the landfill for the operation of the facility, the 52 mile transfer and the operation of the tipper at the landfill site. The transfer station provides "efficient, clean and odour-free operations".

"Efficient Transfer Operation Requires Efficient Trucking",
Waste Age (December 1983)

The number of transfer station permits in the state of Texas has increased from six to thirty over the past five years. This is a result of landfill sites being located increasingly further from populated areas and is considered to be a good solution for small cities not able to operate their own landfill sites. The article notes that two transfer stations in Houston have been converted from inactive resource recovery facilities. These transfer stations have proven to be part of an economical, effective disposal methods and more are expected to be developed.

"Turning a Liability Into an Asset",
Waste Age (December 1983)

A private company in Kalamazoo, Michigan, has opened a transfer station at a former City landfill site which was reopened to take inorganic wastes. The transfer station allows sorting of material so that only organic waste is hauled to the main landfill site. The article notes other advantages of the transfer station, including permitting drivers to complete routes in bad weather or on holidays since loads can be dumped at the station when the landfill is closed or inaccessible due to weather. The transfer station is popular with users and provides recycling containers. In addition, some sorting is done on the tipping floor. The tipping fee at the transfer station is $4 per cubic yard.

"Transfer Station Manual", Bissell & Associates Ltd.
August 1982, prepared for Alberta Environment

The report notes that "in any urban transfer operation, the costs of owning and operating the station itself are entirely unproductive and must be "earned back" by the greater efficiency of the haul vehicle being used. Other unproductive expenses may be incurred at the disposal site, inasmuch as the transfer vehicle may have a longer

unloading time than a collection vehicle". In addition, the report states that "cost figures cannot be generalized, as transfer facility costs are highly site specific".

"Transfer Station Planning" by Larry Schaper in Waste Age, December 1982

The article notes that the decision to establish a transfer station is normally linked to anticipated cost reductions although there may be other benefits which justify costs higher than the direct haul to the landfill by collection vehicles. The article states that "the incentive to utilize a transfer system is greater for collection systems now operating relatively small payload vehicles, and the incentive is also greater for systems where several crew members travel to the disposal site".

4. Economics of Transfer Stations

In the Stage 1 Report, the cost of transfer stations was researched, with the results showing that the costs ranged between $4.00 to $8.00 per ton (1982$) depending on the size of the station; larger stations generally have lower costs due to economies of scale. These figures include both operating and annualized capital costs in a form in which both components increase annually.[3] The Report also concluded that:

> "The maximum saving by using a transfer vehicle instead of a collection vehicle is $0.05/ton minute. The minimum cost for a transfer station is estimated at $4.00 per ton (operating and annualized capital cost). Therefore, a trip of 80 minutes (round trip, including waiting time) would be required to justify a transfer station under the most optimal scenario (80 minutes x $0.05)" (page 128).

In Stage 1, the analysis was generic and not directed to a specific size of station. In Stage 2C, a specific size range of possible stations can be identified. If stations were established in each municipality, the maximum annual capacity required would range from approximately 20,000 tons to

120,000 tons. The annual maximum tonnage for the peak year in the Region is approximately 285,000 tons (Table 9).

As noted previously, economies of scale have a major impact on transfer station costs. The lower end of the range provided in the Stage 1 Waste Needs and Systems Analysis Report ($4.00 per ton in 1982$) generally referred to stations of a much larger size than the range of possibilities in Halton; for instance, the "Solid Waste Management Study" prepared by Kilborn, January 1980, which produced a figure of $4.13, was based on a large station exceeding 375,000 tons per annum. In addition, recent

---

3 Capital costs were annualized using an annuity factor.

figures from Leferink Disposal Ltd. on their proposed station in Halton Hills indicate costs in excess of $9.00 per ton in 1982$.[4]

For this analysis, the transfer station costs require updating to 1984 dollars and consideration of the size range of stations appropriate to the Halton situation. A cost range of $7.00 to $11.00 per ton (1984$) incorporates both of these adjustments.

The revised collection haul cost analysis described in Section 7.4 and Appendix D treats the labour and capital components on a cost per ton minute basis (as in the Stage 1 Waste Needs and Systems Analysis report) and gas and maintenance costs on a cost per ton kilometre. Converting this final component to per ton minute, the total revised haul cost factor is 14¢ per ton minute in 1984 dollars. For transfer vehicle haul costs, Leferink and Tricil Ltd. have confirmed the figure of 6¢ per ton minute as their 1984 costs. The savings from using a transfer vehicle rather than a haul vehicle (1984$) is calculated as follows:

Collection Vehicle Cost	Transfer Vehicle Cost	Savings by Using a Transfer Vehicle
14¢/ton/minute	6¢/ton/minute	8¢/ton/minute

Accordingly, combining the maximum savings of the transfer haul cost (8¢ a ton/minute) with the minimum cost of a transfer station at $7.00 per ton, a haul time of 87 minutes[5] (return trip including drop-off time) would be required to justify a transfer station economically in the most optimal solution. This translates into a one-way haul time of 36 minutes, only a slight increase in the 33 minute figure from the Stage 1 Report (80 minutes round trip minus 15 minutes drop-off time divided by two equals 33 minutes one way trip).

---

4 Capital costs were annualized using an annuity factor as in the Stage 1 Report so that haul costs could be directly compared with transfer station costs.

5 $7.00 ÷ 8¢ = 87 minutes.

APPENDIX F

Region of Halton Compensation Policy

APPENDIX F

The following statement outlines the Region of Halton's policy on compensation with respect to the proposed landfill site. It was developed based on research on the issue in October 1984 and was presented at a series of Workshops held in the candidate site areas on October 15, 16, 17, and 18, 1984.

SUMMARY OF HALTON REGION POSITION ON PROPERTY-OWNER COMPENSATION RE: LANDFILL

A MOST SUITABLE SITE

Firstly, the site selected for landfill purposes will be the most suitable minimizing potential adverse effects on the surrounding community and the Region as a whole.

B MITIGATION

Secondly, whatever site is selected will be designed, equipped, operated and monitored with an extensive list of rigorous mitigation measures in mind, so as to reduce and, wherever reasonably possible, eliminate potential adverse impacts on the community.

C TAKINGS OF LAND FOR SITE

Thirdly, where all or part of an owner's land is needed for the site, the Region will make every effort to negotiate settlements and resolve differences prior to expropriation. If negotiation fails, then The Expropriations Act will be used. The basis on which the land would be valued is market value, as defined under Section 14 of The Expropriations Act. Such market value is established without reference to the purpose to which the land is taken. Where property values continue to be in dispute, the Act requires that the Region make a preliminary offer, without prejudice, in order to relieve the burden on the landowner of hiring appraisers and legal counsel.

D NO TAKINGS OF LAND

Fourthly, where an owner is left with part of his lands after the needs for the site are satisfied or where an owner has no lands taken but in either case believes that adverse impact has been created to his property as a result of the landfill project, he would be entitled to make a claim on his own volition under The Expropriations Act and/or common law. This is the approach which is commonly used by municipalities, Provincial and Federal Departments, and other public agencies in Ontario.

The general understanding of the law in such a case is as follows. It is stressed that this summary is not intended, in any way, to represent legal advice and interested parties should consult their own legal counsel in this regard:

- Where only a part of an owner's land is taken, the owner will be entitled to compensation for the value of the land taken together with "injurious affection". The latter is defined as ANY DIFFERENCE between the market

value of the lands taken plus the market value of the land retained by the owner AND the market value which the entire parcel had prior to the undertaking. This difference is for direct and consequential damages resulting from the construction or use or both of the landfill.

Where none of an owner's lands are taken, compensation can be claimed under The Expropriations Act for "injurious affection" created by the construction (NOT the use) of the landfill. If an owner believes the subsequent use of the landfill causes him/her damage, the owner would make a claim under the common law of nuisance for mismanagement of the site. Proper management of the site would not be "nuisance" at common law because the landfill use itself is lawful.

Under Section 22 of The Expropriations Act injurious affection claims must be made in writing within one year after the damage was sustained.